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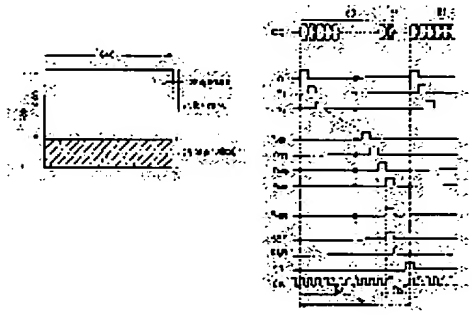
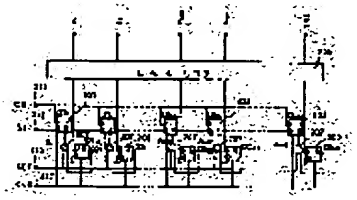
(54) DRIVING METHOD FOR LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PURPOSE: To effect effective drive in response to the number of various effective scanning lines by simultaneously selecting a plurality of scanning lines during a return period to read a non-display signal, regarding a scanning line not used for display even when display having the number of effective scanning lines lower than the whole number of scanning lines is carried out.





CONSTITUTION: Whole effective scanning line P (j=1, 2,...400) is scanned during a display period Td to display information. When selection of, for example, a 400th scanning electrode Yj (21) is completed, only 401st - 480th scanning electrodes Yj (21) are brought into a state to be simultaneously set by means of a set signal SET inputted from a SET signal terminal 215. Thereby, a set signal ST transferred by means of a subsequent shift clock signal CK produces a gate pulse GP for each of 401st - 480th scanning electrodes Yj (21). This method causes collective application of non-display signals 81 during a return period Tb, regarding scanning lines Pj in a non-display region 25.

TECHNICAL FIELD

(Field of the Invention)
this invention relates to the drive method of the liquid crystal display in which the display from which the drive method of a liquid crystal display is started, especially the number of effective scanning lines of an input video signal differs is possible.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Objects of the Invention]
(Field of the Invention)
this invention relates to the drive method of the liquid crystal display in which the display from which the drive method of a liquid crystal display is started, especially the number of effective scanning lines of an input video signal differs is possible.
(Prior art)
In recent years, many liquid crystal displays have come to be used as a display of television, a personal word processor, a personal computer, etc. taking advantage of advantages, such as small and a low power.
Since the high-definition display is possible for it even if the active matrix type liquid crystal display with which the nonlinear element was prepared for every pixel especially makes the number of scanning lines increase by carrying out the switching drive of the nonlinear element prepared for every pixel, it attracts attention.
This active matrix type liquid crystal display is explained with reference to a view 1.
A view 1 is what is shown in the outline block diagram of an active matrix type liquid crystal display (1). n signal electrodes Xi (i= 1, 2, --, n) connected to the signal-electrode drive circuit (101) (11), m scanning electrodes Yj (j= 1, 2, --, m) (21) connected to the scanning electrode drive circuit (201) are arranged in the shape of a matrix, and the pixel electrode (41) connected to TFT (31) is installed in each intersection.
And the m scanning lines Pj (j= 1, 2, --, m) are constituted by two or more pixel electrodes (41) connected to one scanning electrode Yj (21).
A gate electrode (31a) this TFT (31) to the scanning electrode Yj (21) A source electrode (31b) is connected to a signal electrode Xi (11), and the drain electrode (31c) is connected to the pixel electrode (41). According to the gate pulse GP from a scanning electrode drive circuit (201) inputted into a gate electrode (31a), ON/OFF control between a source electrode (31b) and a drain electrode (31c) accomplishes.
And such a liquid crystal display (1) operates as follows. Namely, a video signal SIG is inputted into a signal-electrode drive circuit (101), and digital one or 1 display pixel signal by which analog processing was carried out is impressed to each signal electrode Xi (11) for every scanning interval.
The one-frame period Tf is constituted by the display period Td and the fly-back-line period Tb, and this video signal SIG is formed for this fly-back-line period Tb in consideration of time for cathode rays to return to a scanning starting position supposing the CRT display.
Moreover, the shift clock creatine kinase for transmitting scanning start signal ST and this scanning start signal ST to each scanning electrode Yj (21) is inputted into a scanning electrode drive circuit (201). By this, each scanning electrode Yj (21) will be chosen one by one, and one screen will consist of one-frame periods Tf.
(Object of the Invention)
By the way, the number of the scanning lines (effective scanning lines are called hereafter.) which constitute a viewing area from recent years is various from 200 things to 480 by the software used.
Since black is automatically displayed about the scanning lines other than effective scanning lines, self emitted-light type Braun tube or plasma display etc. does not need to scan. However, since a liquid crystal display is not a self-luminescence type, in order to prevent the malfunction of liquid crystal, it needs to impress a certain voltage also about the scanning lines other than effective scanning lines.
For this reason, it is necessary to scan also about the scanning line which constitutes a non-display field from a liquid crystal display, and to impress a non-display signal.
For example, when the number of scanning lines displays as effective scanning lines among 400 liquid crystal displays using 200 of the moiety of all the scanning lines, it is necessary to scanning only 200 effective scanning lines to scan also about the scanning line which is not used for a display with a liquid

crystal display with the Braun tube.
For this reason, when all the scanning lines are sequentially scanned by one scanning interval which scans the 200 scanning lines, all the scanning lines cannot be scanned within the one-frame period Tf, and it is **********.
Then, when there are few effective scanning lines than all the number of scanning lines of a liquid crystal display, there is the method of shortening one scanning interval and scanning about all the scanning lines, i.e., the method of changing and scanning a time-axis.
However, once a time-axis change means is required in equipment, and also giving storage elements, such as a frame memory, and carrying out memory of the video signal SIG of the 1 display screen, it is necessary to make it output one by one by the method accompanied by change of such a time-axis.
For this reason, by the drive method accompanied by change of a time-axis which was mentioned above, in order to cause enlargement of the required shell and equipment which give a time-axis change means ****** storage element, and high cost-ization, it was not able to be said as a desirable method.
this invention was made in view of the technical problem mentioned above, and even if it is the case where the display with few effective scanning lines than all the number of scanning lines is performed, it aims at offering the drive method of the liquid crystal display which does not cause enlargement of equipment, or high cost-ization.
[Elements of the Invention]
(The means for solving a technical problem)
It is the drive method of the liquid crystal display which this invention was equipped with the viewing area constituted by two or more scanning lines, and was equipped with the 1st display mode with equal number of scanning lines and number of effective scanning lines of an input video signal, and the 2nd display mode with few effective scanning lines than the number of scanning lines, and the 2nd display mode is characterized by scanning simultaneously two or more scanning lines other than effective scanning lines within the fly-back-line period within an one-frame period.
(Work for)
As mentioned above, when performing the display with few effective scanning lines than all the scanning lines, by the drive method of the liquid crystal display of this invention, two or more scanning lines other than effective scanning lines are simultaneously scanned within the fly-back-line period Td within the one-frame period Tf.
Thus, even if it is a case with few effective scanning lines of an input video signal than all the scanning lines by driving a liquid crystal display, it does not need to be accompanied by change of a time-axis etc. Thereby, it is not necessary to prepare a time-axis change means or a storage element in the interior of equipment, and, according to the drive method of this invention, it becomes possible to fully scan all the scanning lines within the one-frame period Tf.
If it is the liquid crystal display which serves as a black display at the scanning lines other than effective scanning lines for example, at the time of 0V impression, by impressing the voltage of 0V to a non-display field, a high contrast property can be acquired between a viewing area and a non-display field, and it is desirable to especially the drive method of this invention.
Moreover, as timing which scans the scanning lines other than effective scanning lines, if it is within the fly-back-line period Tb within the one-frame period Tf, it is good always. Moreover, scanning collectively is desirable when simplification of an equipment configuration is taken into consideration although it divides and scans to plurality even if it scans the scanning lines other than effective scanning lines collectively or.
(Example)
Hereafter, the drive method of the liquid crystal display of one example of this invention is explained with reference to a drawing.
A view 1 is what shows the outline block diagram of the liquid crystal display (1) of one example for realizing the drive method of the liquid crystal display of this invention. 640 signal electrodes Xi (i= 1, 2, --, 640) connected to the signal-electrode drive circuit (101) (11), 480 scanning electrodes Yj (j= 1, 2, --, 480) (21) connected to the scanning electrode drive circuit (201) are arranged in the shape of a

matrix, and the pixel electrode (41) connected to TFT (31) is installed in each intersection.
And the scanning line Pj (j= 1, 2, --, 480) (not shown) will be constituted by two or more pixel electrodes (41) connected to one scanning electrode Yj (21).
A gate electrode (31a) this TFT (31) to the scanning electrode Yj (21) A source electrode (31b) is connected to a signal electrode Xi (11), and the drain electrode (31c) is connected to the pixel electrode (41). According to the gate pulse GP from a scanning electrode drive circuit (201) inputted into a gate electrode (31a), ON/OFF control of [between a source electrode (31b) and a drain electrode (31c)] is carried out. Moreover, the liquid crystal constituent (61) was pinched by the counterelectrode (51) corresponding to each pixel electrode (41), and when the potential difference between a pixel electrode (41) and a counterelectrode (51) was 0V, it considered as the liquid crystal display (1) used as a black display.
it is shown in a view 2 using this liquid crystal display (1) -- as -- all the scanning lines Pj (j= 1, 2, --, 480) (22) -- a viewing area (24) explains the 2nd display mode constituted by 400 effective scanning lines Pj (j= 1, 2, --, 400) among several 480
the status signal (83) shown in a view 3 and the video signal SIG which has a non-display signal (81) input into a signal-electrode drive circuit (101) -- having -- every 1 operation period -- 1 scanning-line Pj (-- the video signal SIG for 22) is outputted to each signal electrode Xi (11) one by one Moreover, from a scanning electrode drive circuit (201), the gate pulse GP shown in a view 3 is impressed to each scanning electrode Yj (21) one by one for every scanning interval.
Thereby, within the display period Td, effective scanning lines Pj are scanned sequentially and a status signal is displayed on a viewing area (24).
Moreover, within the fly-back-line period Tb, the scanning line Pj (j= 401, 402, --, 480) of a non-display field (25) bundles up, and is scanned, and a non-display field (25) serves as a black display.
Thus, a scan will be performed within 1 field period Tf about all the scanning lines Pj (j= 1, 2, --, 480) (22), and the 1 display screen will be constituted.
Next, the concrete composition of the scanning electrode drive circuit (201) for generating such a gate pulse GP is explained to be ******.
A view 4 shows the important section representative circuit schematic of a horizontal-scanning electrode drive circuit (201), and is equipped with the shift register which has the set-reset function which was connected so that scanning start signal ST from ST signal terminal (213) might be transmitted one by one by clock signal creatine kinase from creatine-kinase signal terminal, and which is constituted by 480 D-flip-flops D1j (j= 1, 2, --, 480) (203).
After being controlled to become predetermined voltage by the level shifter (209), the output from this D flip prop D1j (203) is connected so that it may be impressed by each scanning electrode Yj (21) as a gate pulse GP. Moreover, the output of the AND gate (207) for carrying out set-reset control of this D-flip-flop D1j (203) is connected to D-flip-flopD1j (203). And one input terminal of the AND gate (207) is connected to a SET signal terminal (215), it connects with the output of D-flip-flop D2j (j= 1, 2, --, 480) (205) which operates considering the output of input terminal D-flip-flop D1j (203) of another side as a clock, and the scanning electrode drive circuit (201) is constituted.
A display action which was mentioned above becomes possible by impressing shift clock signal creatine kinase as shown in such a creatine-kinase signal terminal (211) of the scanning electrode drive circuit (201) of circuitry, ST signal terminal (213), a SET signal terminal (215), and a CLR signal terminal (217) in a view 3, scanning start signal ST, the set signal SET, and the clear signal CLR.
That is, scanning start signal ST is transmitted one by one to D-flip-flop D1j (203) by shift clock signal creatine kinase, and is outputted to each scanning electrode Yj (21) as a gate pulse GP. Thereby, within the display period Td, all the effective scanning lines Pj (j= 1, 2, -- 400) are scanned, and informational presenting is performed.
And after selection of 400 Motome's scanning electrode Yj (21) is completed, 401 to 480 scanning electrodes (21) (21) Yj Yj, i.e., the scanning electrode of a non-display field (25), will be in the state which can be set simultaneously with the set signal SET inputted from a SET signal terminal (215).
Thereby, a level shifter (209) considers as predetermined voltage, and the set signal ST transmitted by

the following shift clock signal creatine kinase is outputted so that it may become the gate pulse GP of each scanning electrode Yj of 480 Motome (21) from 401. By this, about the scanning line Pj of a non-display field (25), they will be collectively impressed by a non-display signal (81) and (refer to the 3rd view) within the fly-back-line period Tb.
And all D-flip-flop D1j (203) is reset by the clear signal CLR, and the next display is attained.
as mentioned above, it is not necessary to carry out shortening etc. and, according to the drive method of the liquid crystal display of this example, a time-axis can be easily performed by easy circuitry by boiling the few drive of an effective-scanning-lines Pj number, also receiving rather than the total number of the scanning lines Pj (22), bundling up about the scanning line Pj (22) of a non-display field (25), and impressing a non-display signal (81) within the fly-back-line period Tb
Next, the drive method of the liquid crystal display of other examples of this invention is explained.
A view 5 shows the display screen of the 2nd display mode with which a viewing area (24) is constituted by 400 effective scanning lines Pj (j= 41, 42, --, 440), and is equipped with the non-display field (23) constituted by the scanning line Pj of the-40 upper and lower sides of a viewing area (24), and (25).
More easily than choose each scanning electrode Yj (21) by the gate pulse GP shown in the 6th view and impressing a video signal SIG, such a display can be performed as it is possible.
The one-frame period Tf changes by the display period Td and the fly-back-line period Tb, and the display period Td is constituted for the video signal SIG shown in a view 6 by the status signal (83) and the non-display signal (81).
The gate pulse GP shown in a view 6 is impressed to the sequential-scanning electrode Yi (21) for every scanning interval, and presenting of display information is performed by effective scanning lines Pj (j= 41, 42, --, 440).
And within the fly-back-line period Tb within the one-frame period Tf, the scanning lines Pj (j= 1, 2, --, 40) and Pj (j= 441, --, 480) other than effective scanning lines (j= 41, 42, --, 440) Pj bundle up by the gate pulse GP shown in a view 6, it is scanned, and a non-display signal (81) is impressed. Thus, all the scanning lines Pj (22) will be scanned within the one-frame period Tf, and the 1 display screen will be constituted.
Next, if possible, one example of the scanning electrode drive circuit (201) of the liquid crystal display (1) for closing such a drive is explained with reference to the representative circuit schematic of the scanning electrode drive circuit (301) of a view 7.
The shift register is constituted by D-flip-flop D1j (j= 1, 2, --, 480) (303), and it is transmitted to D flip-flop D11 (303) of the first rank one by one with the shift clock creatine kinase 2 which the input signal D13 inputted from an input terminal (317) is inputted, and is inputted from an input terminal (319).
Each output terminal Q of this D flip-flops each D1j (303) is connected to each switching device Sj (305) so that the switching device Sj (j= 1, 2, --, 480) (305) which can choose two inputs may both be controlled when it comes to the input of D-flip-flop D1j (303) of the next step. And it connects with one input terminal of the switching device S1 (305) of the first rank so that the signal DI 1 from an input terminal (311) may be considered as an input, and the output terminal Q of D-flip-flop D2j (j= 1, 2, --, 479) (307) is connected to the input terminal of other switching devices Sj (305). Moreover, it connects with the input terminal of another side of a switching device Sj (305) so that the signal D12 from an input terminal (315) may be considered as an input.
Moreover, while the input terminal D of D-flip-flop D2j (307) is connected to the output terminal of the adjoining switching device Sj (305), it connects with each scanning electrode Yj (21) through Buffer BFj (j= 1, 2, --, 480) (309), and the scanning electrode drive circuit (201) is constituted.
And by inputting the predetermined signal DI 3 into an input terminal (317) It is controlled so that switching devices Sj (j= 1, --, 40) and Sj (j= 441, --, 480) (305) choose the input signal DI 2 from an input terminal (315). It controls so that a switching device Sj (j= 41, --, 440) (305) is connected to the output terminal Q of D-flip-flop D2j (j= 40, --, 439) (207). It enables this to output easily the gate pulse GP as shown in a view 6.
Although the display mode (refer to the 5th view) with 400 effective scanning lines which display

considering the scanning lines Pj (j= 1, --, 40) and Pj (j= 441, --, 480) as a non-display field (23) and (25) was explained here by making the scanning line Pj (j= 41, --, 440) into a viewing area (24) It can respond to various effective-scanning-lines Pj numbers of display modes with the signal DI 3 inputted into an input terminal (217).
Moreover, it can change variously easily also about a display position with the signal DI 3 inputted into an input terminal (217).
Next, other examples of this invention are explained with reference to a drawing.
Like the example mentioned above, as shown in a view 5, an effective-scanning-lines Pj number explains the 2nd 400 display modes among a total of 480 scanning-line Pj numbers.
An octavus view is a timing chart showing one example of the drive method of the liquid crystal display of this example. After the drive method of the liquid crystal display (1) of this example scanning effective scanning lines Pj (j= 41, 42, --, 440) sequentially for every scanning interval and impressing a status signal (83) The scanning lines Pj (j= 1, --, 40) other than effective scanning lines (j= 41, 42, --, 400) Pj are scanned within the fly-back-line period Tb within the one-frame period Tf. a non-display signal (81a) Furthermore, the scanning line Pj (j= 441, --, 480) is scanned, and a non-display signal (81b) is impressed.
Thus, rather than all the scanning lines Pj, in the 2nd few display mode, effective scanning lines Pj may divide the scanning lines Pj other than effective scanning lines Pj into two within the fly-back-line period Tb, and may impress a non-display signal (81a) and (81b).
Even if it does in this way, it is not necessary to establish a storage element or time-axis change meanses, such as a frame memory, etc. in a liquid crystal display (1) like the example mentioned above, and can display easily corresponding to the various numbers of effective scanning lines.
Next, if possible, one example of the scanning electrode drive circuit (401) of the liquid crystal display (1) for closing such a drive is explained with reference to the representative circuit schematic of the scanning electrode drive circuit of a view 9.
In the view 9, each switching device S1j (j= 1, 2, --, 480) (405) is constituted by the output from a serial parallel conversion circuit (403) so that it may be controlled. It connects with three input terminals (421), (425), and (427), and the switching device S11 (405) of this first rank has selectable inputs DI1, DI2, and DI3.
and other switching device S1j (j= 2, --, 480) (405) -- an input terminal (421) -- instead of -- D flip-flop Dj (j= 1, 2, --, 479) (407) -- it connects with Output Q
Moreover, the output Q of this D flip-flop Dj (407) turns into an input of switching device S2j (j= 1, 2, --, 480) (411) of the next step through switching device S2j (j= 1, 2, --, 480) (411) while connecting with each scanning electrode Yj (21) through an output buffer BFj (j= 1, 2, --, 480) (409). ON/OFF control of this switching device S2j (411) is carried out like switching device S1j (j= 2, --, 480) (405) by the output from a serial parallel conversion circuit (403).
Thus, by inputting a predetermined signal into the serial parallel conversion circuit (403) of the scanning electrode drive circuit (401) constituted Switching device S1j (j= 1, 2, --, 40) (405) to an input DI 3 Switching device S1j (j= 41, 42, --, 440) (405) is connected to the output Q of D flip-flop Dj (j= 40, 41, --, 439) (407), and switching device S1j (j= 441, 442, --, 480) (405) is further connected to an input DI 2. Moreover, only switch S2j (j= 440) (411) will be in a connection state.
By this, it bundles up to the scanning electrode Yj (21), and a gate pulse GP will be impressed, it will bundle up to the scanning line Pj (j= 1, 2, -- 40), and a non-display signal (81b) will be impressed. And gate BARUSU GP is impressed to the scanning electrode Yj (j= 41, 42, --, 440) (21) which constitutes effective scanning lines Pj (j= 41, 42, --, 440) one by one for every scanning interval, a status signal (83) is impressed to it by this, and the 1 display screen is constituted. Furthermore, it will be collectively scanned by the scanning line Pj (j= 441, 442, --, 480) within the fly-back-line period Tb, and a non-display signal (81a) will be impressed to a non-display field (25).
It also becomes easy to change a display position by setting up various signals inputted into a serial parallel conversion circuit (403) by considering as the composition which made the scanning electrode drive circuit (401) for realizing the drive method of the liquid crystal display of this example, for

example, was mentioned above.
As explained in full detail above, according to the drive method of the liquid crystal display of this example, it becomes possible by dividing and scanning the scanning lines other than effective scanning lines in a package or two or more groups within the one-frame fly-back-line period Tb of Period Tf not to be accompanied by change of a time-axis etc. and to scan about all the scanning lines within the one-frame fly-back-line period Tb of Period Tf.
Thereby, the circuitry for realizing this invention is also made to a very easy thing.
[Effect of the Invention]
As mentioned above, even if it is the case where the display with few effective scanning lines than all the number of scanning lines is performed according to the drive method of the liquid crystal display of this invention, change of a time-axis etc. is not needed by choosing two or more scanning lines simultaneously within the fly-back-line period Tb about the scanning line which is not used for a display, and writing in a non-display signal. For this reason, corresponding to the number of effective scanning lines of various kinds [cause / enlargement of equipment, or high cost-ization], it can drive effectively.

[Translation done.]